CONSIDERATION OF STAFF RECOMMENDATION REGARDING FINANCING PROJECTS USING WASTEWATER TREATMENT TECHNOLOGIES
October 27, 2010

STAFF SUMMARY – CPCFA
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ISSUE. As a matter of policy, should the State allow tax-exempt bonds to be used for projects that use wastewater treatment technologies to remove contaminants from process water?

BACKGROUND. In recent months there has been interest in using tax-exempt bonds to finance projects that use wastewater treatment technologies to remove contaminants from process water.

CPCFA has received a request from Hilmar Cheese Company, Inc. ("Hilmar Cheese" or "Company"), to fund the acquisition, construction, and installation of equipment used to improve and increase capacity to the Company's wastewater treatment operations. At the November 19, 2008 meeting, the CPCFA Board approved an Initial Resolution (IR) for Hilmar Cheese. Hilmar Cheese expects to request a Final Resolution (FR) from the CPCFA Board in October 2010.

Hilmar Cheese Company, Inc. Hilmar Cheese produces cheese and whey products from its facility in Hilmar, California. More than one million pounds of cheese is produced each day, and in order to produce this amount of cheese, the Company processes more than one million gallons of milk each day received from more than 270 dairies and 160,000 cows. More cheese is produced from this facility than any other manufacturer in the world.

Due to the limitations of the prior wastewater processing technologies, the Company was unable to meet certain salinity discharge requirements established by California Regional Water Quality Control Board (CRWQCB). On January 26, 2005 an Administrative Civil Liability Complaint was filed against the Company by CRWQCB for discharging wastewater containing salt that exceeded allowable levels.

A Settlement Agreement was reached between CRWQCB and the Company on March 16, 2006. The Settlement Agreement included $1.85 million to fund a Supplemental Environmental Project, $1 million (a civil liability) in penalties paid to the State's Waste Discharge Permit Fund, and $150,000 as reimbursement to the California Attorney General's office for work on the case. The major component of the Settlement Agreement was the environmental project. The Company was responsible for financing an independent environmental study focused on water quality, the food industry, and its salt waste issues. The study was completed and is intended to provide information that will be useful to the CRWQCB in developing a comprehensive salt management strategy for the Central Valley. In January 2010, the CRWQCB adopted a final permit for Hilmar Cheese that requires the Company to further enhance and improve the

operation of its wastewater processing activities so that the Company achieves 100% compliance with the amount of salt in its effluent by February 15, 2011.

Hilmar Cheese has continued to enhance its wastewater processing activities in order to correct the salt amount of its effluent to the permitted levels. It currently operates its own, on-site water reclamation plants. The highly customized, fully integrated four-stage system represents the single largest investment in water treatment made by any food processor in California. The initial treatment stage is the Dissolved Air Floatation. The second stage contains an Expanded Granular Sludge Bed Anaerobic Digester. The third stage uses Sequencing Batch Reactors, and the fourth stage includes the Ultrafiltration and Reverse Osmosis systems. This treatment system removes nearly all of the organic compounds while reducing salts and other minerals in the process water.

Sixty percent of fully-treated process wastewater is recycled and used as irrigation water by local farmers. The remaining salt water solution is either hauled off site to a municipal facility at a considerable cost to the Company or the remaining salt water will be disposed through a Class I Deep Well Injection method. Hilmar Cheese has requested CPCFA issue bonds to fund the enhancement and expansion of its existing wastewater treatment plant including facilities related to the ultimate disposal of the treated effluent.

Regulatory Jurisdictions. There are different regulatory jurisdictions for some of the wastewater treatment technologies. The California State Water Boards regulate wastewater discharges to both surface water and to land. Specific wastewater discharge requirements are imposed and permits are issued by California Regional Water Quality Control Boards. Sites using Anaerobic Digestion would potentially be regulated under the California Department of Resources and Recovery's compostable material handling regulations depending upon the nature of the feedstock and how it is being handled. Also, the U.S. Environmental Protection Agency (EPA) issues permits and inspects sites for Class I and III deep injection wells. The California Department of Conservation, Division of Oil, Gas, and Geothermal Resources issues permits and conducts inspections for Class II deep injection wells and for Class V deep injection wells associated with geothermal power production.

Environmental Issues. The technologies the Company uses will generate the following environmental benefits.

Climate Change. The Company is a member of the California Climate Action Registry and has been recognized in the Registry as a leader in working to reduce greenhouse gas emissions.

Air Quality. The Anaerobic Digesters can reduce greenhouse gas emissions through methane capture. Deep Well Injection is an alternative to the hauling of greater than 20 truckloads of saline solution a day for further wastewater treatment in a Bay Area treatment plant. It can reduce the transportation and carbon emission from the trucks.

Water Quality. The treatment process will render the water suitable to supplement surrounding crop production reducing the consumption of water local farmers would otherwise require. The treatment system removes nearly all of the organic components such as sugar, protein, and fats from milk. The Dissolved Air Floatation system can remove the initial solids from the effluent.

The Sequencing Batch Reactor system has the capability to reduce phosphorus and nitrogen loading in wastewater. The Ultrafiltration and Reverse Osmosis processes remove minerals and pollutants including bacteria and viruses in the wastewater. Deep well injection can improve the water quality since it prevents the discharge of pollutants to surface water.

Recycling of Commodities. Solids removed from the water treatment will be composted offsite and/or and disposed of offsite by the Company.

Renewable Energy. The biogas, a product of the Anaerobic Digestion, can be used to generate heat and electricity**.**

Experts. The agencies that are familiar with the various wastewater treatment technologies are California State and Regional Water Quality Control Board, U.S. EPA, and California Department of Resources and Recovery which conducts various technology evaluations with the University of California.

WASTEWATER TREATMENT TECHNOLOGIES. There are numerous technologies to treat water that has been contaminated by industrial activities prior to its release into the environment or its re-use. The following are some of the wastewater treatment technologies in use by Hilmar Cheese.

Dissolved Air Floatation. Dissolved Air Floatation (DAF) is a gravity separation system that uses air bubbles in a wastewater holding tank to help float insoluble materials to the surface. These fine bubbles are achieved through saturating the wastewater at high pressure and then releasing the pressure. The rising bubbles either adhere to or are trapped in the suspended particles, resulting in a decrease in gravity of the bubble-particle complexes and thus they can be rapidly floated to the surface. The floated solids such as fats, oils, and grease are skimmed and the non-floatable heavier solids that settle to the bottom of the tank are removed. The clarified water is withdrawn from the bottom of the DAF system. [1]

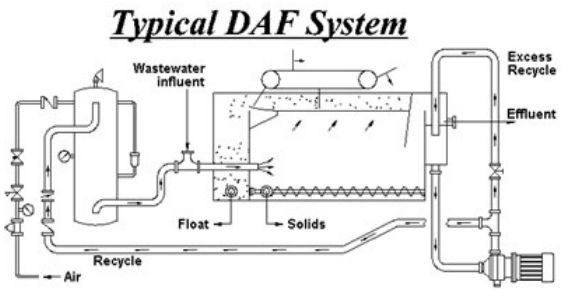

Figure 1: Dissolved Air Floatation System

[1] National Academy of Sciences Website. Retrieved February 3, 2009 from http://www.drinking-water.org/html/en/Treatment/Coagulation-Flocculation-technologies.html

Anaerobic Digestion. On April 23, 2008, CPCFA staff submitted a technology review paper on Anaerobic Digestion (AD) for the Authority's approval. Due to the pollution control benefits AD can provide, the Authority approved the consideration of applications for tax-exempt financing of AD projects.

AD is a process in which microorganisms break down biodegradable material into biogas, which consists of methane (CH4), carbon dioxide (CO2), and other trace amount of gases. The biogas can be used to generate heat and electricity. AD is widely used to treat wastewater sludge and organic wastes because it provides volume and mass reduction of the input material, while producing renewable energy.[2] Facilities and controlled temperature are critical requirements for the AD process. Methane producing bacteria are most active in two temperature ranges, 95° to 105°F (mesophilic) and 130° to 135°F (thermophilic). Depending on the waste feedstock, temperature and the system design, biogas is typically 55 to 75 percent pure methane.[3] The system used by the Company is mesophilic and produces biogas that is greater then 70 percent. AD can be best achieved at temperatures of about 98°F (mesophilic) and 130°F (thermophilic). Also, moisture contents in greater than 85% or higher are suitable for AD.

One form of Anaerobic Digester is an Expanded Granular Sludge Bed Anaerobic Digester (EGSB); this is a sealed digester with highly settleable granular biomass. A fast rate of upward-flow velocity is designed for the wastewater passing through the sludge bed—an aggregate of microorganisms attaching to each other and forming into dense compact biofilms referred to as "granules." Due to their large particle size (generally ranging from 0.5 to 2 mm in diameter), the granules resist washout from the reactor, permitting high hydraulic loads.[4] The increased flux permits partial expansion of the granular sludge bed, improving wastewater-sludge contact as well as enhancing segregation of small inactive suspended particles from the sludge bed. [5] Since a higher population of microorganisms is maintained inside the digester, the hydraulic retention time (length of time that a soluble compound remains in a reactor) is reduced.[6] The increased flow velocity can be accomplished by utilizing tall reactors or by incorporating an effluent recycle.

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[2] California Energy Commission website. Retrieved January 6, 2009 from http://www.energy.ca.gov/research/renewable/biomass/anaerobic_digestion/index.html

[3] Staff Summary of Consideration of Staff Recommendation Regarding Financing Projects Using New Biosolids Conversion Technology by *Michael Smith.* April 23, 2008

[4] Anaerobic Granular Sludge Bed Technology by Jim Field.Retrieved February 6, 2009 from http://www.uasb.org/discover/granules.htm .

[5] Anaerobic Granular Sludge Bed Reactor by Jim Field. Retrieved February 6, 2009 from http://www.uasb.org/discover/agsb.htm#egsb

[6] Greening Waste: Anaerobic Digestion for Treating the Organic Fraction of Municipal Solid Wastes by Karena Ostrem, Columbia University. Retrieved January 7, 2009 from http://www.seas.columbia.edu/earth/wtert/sofos/Ostrem_Thesis_final.pdf

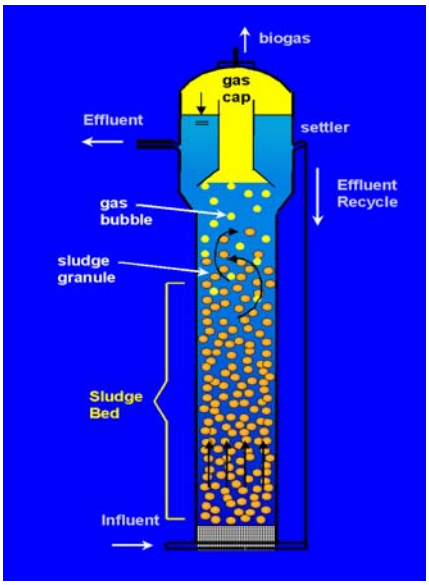

Figure 2: Expanded Granular Sludge Bed Anaerobic Digester

Sequencing Batch Reactor. The Sequencing Batch Reactor (SBR) is a contact digester for waste digestion as well as biomass separation from the effluent. In a SBR, aerobic decomposition, settling, and return occur in the same tank, which is operated in a fill and draw mode. In this system, wastewater is added to the reactor and air is bubbled through the wastewater during the decomposition cycle. Then the bubbler shuts off and the wastewater goes through a settling cycle. After settling of bacteria and solids, the treated effluent is discharged.[7] The reactor can equalize, aerate, and clarify process water. SBR systems have been successfully used to treat both municipal and industrial wastewater. SBR systems also have the capability to reduce phosphorus and nitrogen loading in wastewater.

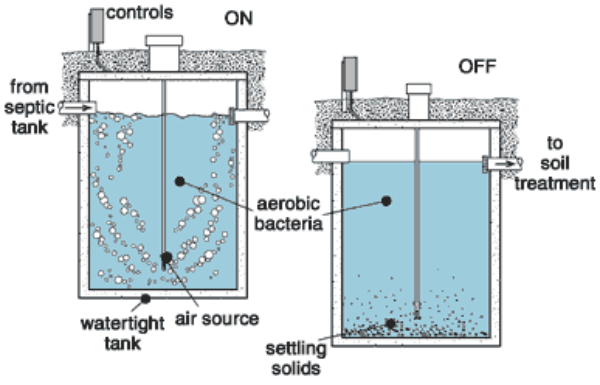

Figure 3: Sequencing Batch Reactor

Ultrafiltration. Ultrafiltration (UF) is a pressure-driven, membrane filtration process that is used to separate and concentrate macromolecules, colloids, and organic components such as sugar,

[7] Aerobic Treatment Unit by University of Minnesota Extension. Retrieved January 6, 2009 from http://www.extension.umn.edu/distribution/naturalresources/DD7667.html

protein, and fats from wastewater. A fluid is placed under pressure on one side of a perforated membrane of a measured pore size. All materials smaller than the measured pore size pass through the membrane, leaving large contaminants concentrated on the feed side of the membrane. UF removes micro-pollutants including bacteria and viruses; however, it does not remove salts in the water. [8]

Figure 4: Ultrafiltration System

Since the UF process cannot separate constituents from water as effectively as Reverse Osmosis, the two technologies can be used in tandem, with UF removing most of the relatively large constituents of a process stream before the Reverse Osmosis application selectively removes other constituents from the wastewater.

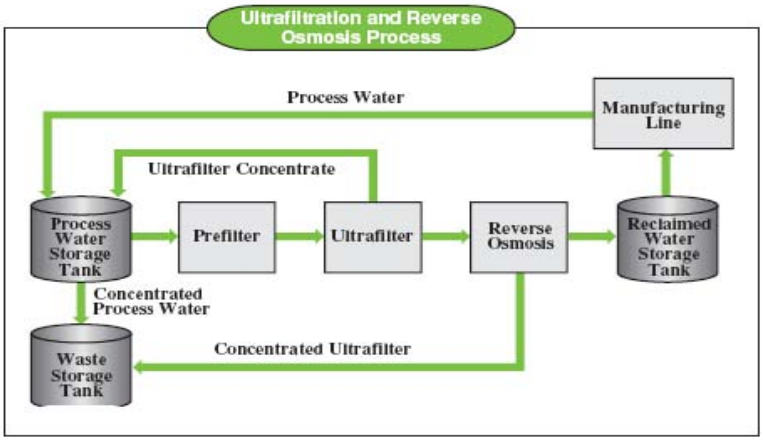

Figure 5: Ultrafiltration and Reverse Osmosis Process

Reverse Osmosis. Reverse Osmosis (RO) is other membrane separation process typically used for wastewater treatment. It works by using pressure to force a solution through a membrane, retaining the solute on one side and allowing the pure solvent to pass to the other side. The RO system uses a semi-permeable membrane to separate pure water from contaminated liquids.This

[8] Joint Services Pollution Prevention Opportunity Handbook. Retrieved January 5, 2009 from http://www.p2sustainabilitylibrary.mil/P2_Opportunity_Handbook/9-II-5.html

is the reverse of the normal osmosis process, which is the natural movement of solvent from an area of low solute concentration, through a membrane, to an area of high solute concentration when no external pressure is applied. With reverse osmosis, the membrane pore size is very small allowing only small amounts of very low molecular weight solutes to pass through the membranes.[9] However, salt ions are rejected by a mechanism related to the valence of the ion. Ions are repelled by dielectric interactions; ions with higher charges are repelled to a greater distance from the membrane surface. The nominal rejection ratio of common ionic salts is 85 - 98%.[10] The remaining treated water can be stored in a pond prior to being disposed or re-used as irrigation water. The salt water solution can be disposed using the Deep Well Injection technology.

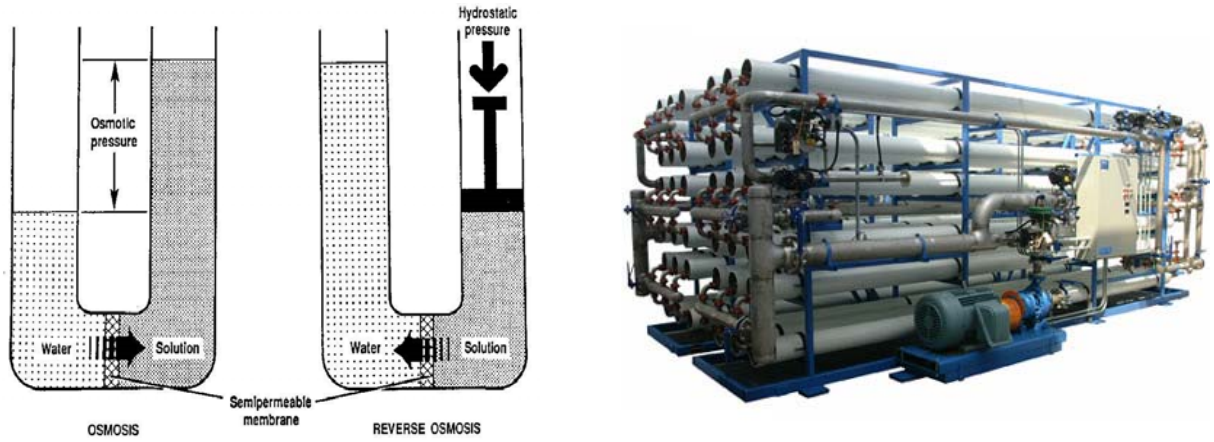

Figure 6: Reverse Osmosis System

Deep Well Injection. Deep Well Injection (DWI) is a liquid waste disposal technology to place treated or untreated liquid waste into geologic formations. A typical injection well consists of concentric pipes, which extend several thousand feet down from the surface level into highly saline, permeable injection zones that are confined vertically by impermeable strata. The outermost pipe or surface casting extends below the base of any underground sources of drinking water (USDW) and is cemented back to the surface to prevent contamination of the USDW. The existing permitted deep well injection facilities are limited to a narrow range of specific wastes.[11]

Some environmentalists are concerned with the potential for contamination of drinking water supplies caused by the practice of deep well injection of hazardous wastes. However, before issuing the deep well injection permits, the regulatory authorities conduct extensive assessments to ensure the proposed operation of the deep well is protective of all USDW and in compliance

[9] University of Guelph website. Retrieved January 7, 2009 from http://www.foodsci.uoguelph.ca/dairyedu/membrane.html#ro

[10] ITG Subject: Reverse Osmosis. Issued by Food and Drug Administration in October 1980. Retrieved January 5, 2008 from http://www.fda.gov/ora/Inspect_ref/itg/itg36.html

[11] Remediation Technologies Screening Matrix and Reference Guide, Version 4.0 from Federal Remediation Technologies Roundtable Website. Retrieved February 17, 2009 from http://www.frtr.gov/matrix2/section4/4-54.html

with the Safe Drinking Water Act, which is to "assure that water supply systems serving the public meet minimum national standards for protection of public health." On the other hand, other environmentalists believe deep well injection can provide environmental benefits since it creates no emissions into the air and no discharges to surface water.[12] Many people in the industry believe properly managed deep well injection can be a useful tool and it will continue to be the most cost-effective disposal method for the ever-increasing amount of low concentration/high volume wastes.[13]

Injection wells are classified according to the purpose of the wells:

- Class I – wells used to inject hazardous and non-hazardous wastes below the lowermost USDW.
- Class II – wells associated with the production and storage of oil and gas below the lowermost USDW.
- Class III – wells used in special processing (mining) operations to inject fluid above, into, or below an USDW.
- Class IV – wells used to inject hazardous waste into or above an USDW (currently banned).
- Class V – wells used to inject all other wastes into or above an USDW.[14]

U.S. Environmental Protection Agency (EPA) issues permits and inspects sites for Class I and III deep injection wells. The California Department of Conservation, Division of Oil, Gas, and Geothermal Resources issues permits and conducts inspections for Class II deep injection wells and for Class V deep injection wells associated with geothermal power production.[15]

At the U.S. EPA public hearing for the draft Class I Underground Injection Control permit, several commenters indicated that the Company might not comply with the required permit conditions based on the Company's past wastewater disposal practices. However, U.S. EPA responded that it will conduct ongoing testing and monitoring to ensure the deep well injection is in compliance with the regulations.

Hilmar Cheese received a 10-year Underground Injection Control Permit from U.S. EPA in January 2006 to drill and operate four Class I non-hazardous injection wells. There are approximately 550 Class I wells in the United States providing a safe and inexpensive method to

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[12] Deep Wells a Safe Haven for Hazardous Waste. Environment & Climate News. Published in January 1998 by The Heartland Institute. Retrieved March 4, 2009 from http://www.heartland.org/publications/environment%20climate/article/13901/Deep_Wells_a_Safe_Haven_for_Hazardous_Waste.html

[13] The Regulation of Deep-Well Injection: A Changing Environment beneath the Surface y Earle A. "Rusty" Herbert. Pace Environmental Law Review Volume 14. Issued fall 1996. Retrieved February 17, 2009 from http://www.pace.edu/lawschool/pelr/vol14no1f1996/herbert.html

[14] U.S. Environmental Protection Agency. Retrieved January 7, 2009 from http://www.epa.gov/ogwdw/uic/pdfs/Historical/study_uic_hydr_effects_deep_inj_1990.pdf

[15] Dave Basinger, Environmental Engineer, U.S. Environmental Protection Agency. Email on February 20, 2009.

remove these wastes from the surface environment by isolating them deep below the land surface, away from USDW. Currently, there are no Class I hazardous injection wells in California. Injection zones typically range from 1,700 to more than 10,000 feet in depth. Class I wells are used mainly by the following industries: [16]

- Metal Production
- Chemical Production
- Pharmaceutical Production
- Commercial Disposal
- Food Production
- Municipal Wastewater Treatment

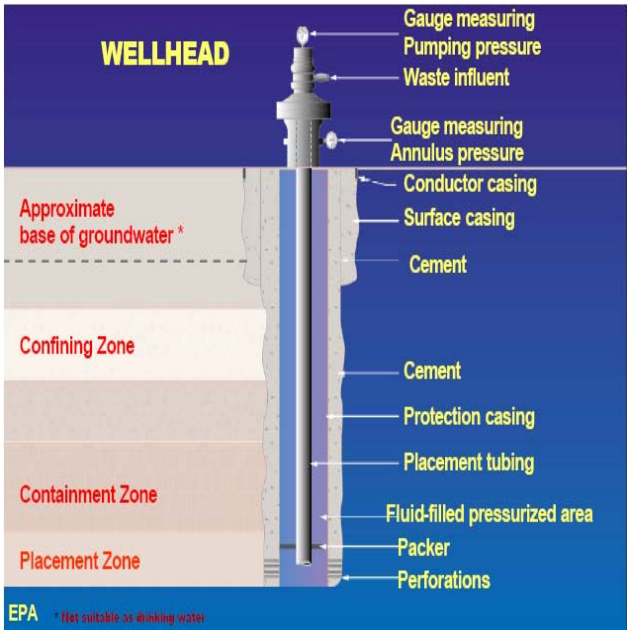

Figure 7: Deep Well Injection System

CPCFA STATUTORY AUTHORITY: In general, CPCFA's statute permits financing of projects related to resource recovery and/or to reduce environmental pollution. Health & Safety Code Sections 44508 and 44539 read, in part:

> "Project" and "pollution control facility" respectively, mean any land, building, improvement thereto, work, real, or personal property or structure, vehicle, or equipment providing or designed to provide for the control, reduction, abatement, elimination, remediation, or prevention of pollution, improvement of air, water, or soil quality, ensure the safe handling, recycling, or disposal of materials that might otherwise be improperly disposed of, or provide for environmental restoration, cleanup, or enhancement.
>
> An applicant for financing for a project involving a waste water treatment plan shall provide evidence satisfactory to the State Water Resources Control Board that the waste water treatment facilities will be operated and maintained by competent personnel. Such evidence shall include,

[16] U.S. Environmental Protection Agency. Retrieved January 7, 2009 from http://www.epa.gov/safewater/uic/wells_class1.html#how_do)

but not be limited to, a description of operating procedures, organizational structure, minimum personnel requirements and training program.

Staff discussions with bond counsel for the project that is the subject of in this review appears to confirm that wastewater treatment projects are qualified sewage facilities and would qualify under federal tax law. According to bond counsel, this type of project qualifies under federal tax law because the facilities to be constructed provide for the treatment of wastewater in accordance with the requirements of the Internal Revenue Code and regulations thereunder.

RECOMMENDATION: Staff finds that there is evidence of pollution control benefits to be derived from tax-exempt financing of qualifying projects using wastewater treatment technologies. Therefore, staff recommends that the Authority direct staff to consider applications for tax-exempt financing of wastewater treatment technology projects and to evaluate each application on its individual merits. Staff acknowledges that applications for wastewater treatment projects will be evaluated on their individual public and pollution control benefits (including climate change, air quality and water quality), financing structure, and legal status. Applications for wastewater treatment projects will be subject to the same degree of scrutiny by staff and by counsel, and subject to the same standards of documentation, as other applications received.